

WHAT IS CLAIMED IS:

See 6/9/1 1. An antenna for a transponder comprising a magnetic core composed of layered rectangular metallic thin plates, and a coil wound on said magnetic core parallel to longer side of said magnetic core.

2. An antenna for a transponder according to claim 1, wherein corners of said thin plate are cut or rounded.

3. An antenna for a transponder according to claim 1, wherein the thin plate comprises an amorphous magnetic material.

4. An antenna for a transponder according to claim 1, wherein the thickness of the thin plate is 20 to 50 μm .

5. An antenna for a transponder according to claim 1, wherein the number of the layered thin plates is 3 to 16.

6. An antenna for a transponder according to claim 1, wherein the ratio B/A of the lengths of the shorter side B to the longer side A of the layered thin plates is 1 or less.

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1. An antenna for a transponder according to claim 6, wherein the ratio B/A of the lengths of the shorter side B to the longer side A of the layered thin plates is 0.4 to 1.0.

Sub 692 8. An antenna for a transponder according to claim 1, wherein the thin plates are insulated by oxidizing their surfaces are layered.

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9. An antenna for a transponder according to claim 1, wherein the diameter of the coil conductor is 100 to 200 μm .

10. An antenna for a transponder according to claim 1, wherein the thickness of the antenna is 0.4 mm or less.

Sub 693 11. An antenna for a transponder according to claim 1, wherein said antenna for a transponder is suitable to carry as an ID card, a commuter pass or a coupon ticket which operates at a frequency of 40 to 200 kHz.

12. A plate transponder comprising two plate antennas composed of a wound conductor on a magnetic core composed of layered metallic thin plates, and an air-core antenna composed of a spirally wound conductor.

13. A transponder according to claim 12, wherein axes of said three antennas are oriented to three directions perpendicular to each other.

Feb 04 14. A transponder according to claim 12, wherein said two plate antennas are provided in the plate transponder so that the axes of said two antennas or coils are perpendicular to each other, and said air-core antenna composed of the spirally wound conductor is provided in the plate transponder so that the axis thereof is perpendicular to the transponder Plate.

Feb 04 15. A transponder according to claim 12, wherein a magnetic recording layer such as a magnetic stripe is provided on the surface of the transponder, and antennas are provided inside the transponder.

16. A transponder according to claim 12, wherein printing is carried out on the surface.

Feb 195 17. A transponder according to claim 12, wherein embossment is formed on the sections other than said antennas, complimentary circuits, and a magnetic recording layer.

18. A transponder according to claim 12, wherein said transponder is suitable to carry as an ID card, a commuter pass or a coupon ticket which operates at a frequency of 40 to 200 kHz.

19. An antenna for a transponder comprising a plate magnetic core composed of a composite material of soft magnetic flakes and a synthetic resin, and a coil wound on said magnetic core.

20. An antenna for a transponder according to claim 19, wherein the soft magnetic material composing said flake is selected from pure iron, silicon steel, a permalloy (an Fe-Ni alloy) and an iron/cobalt amorphous alloy.

21. An antenna for a transponder according to claim 20, wherein the soft magnetic material composing said flake is a cobalt amorphous alloy (Co-Fe-Ni-B-Si).

22. An antenna for a transponder according to claim 19, wherein said flake has a thickness of 30 μm or less and a diameter of 50 to 2,000 μm .

23. An antenna for a transponder according to claim 19, wherein said flake has a thickness of 10 μm or less and a diameter of 100 to 1,000 μm .

24. An antenna for a transponder according to claim 19, wherein said synthetic resin is selected from the group consisting of the thermoset resins, e.g. epoxy resins, phenol resins, urea resins, unsaturated polyester resins, ~~diacryl~~ phthalate resins, melamine resins, silicone resins, and polyurethane resins; and thermoplastic resins, e.g. polyethylene resins, polypropylene resins, vinyl chloride resins, fluoroplastics, methacrylate resins, polystyrene resins, AS resins, ABS resins, ABA resins, polycarbonate resins, ~~polyacetal~~ resins, and polyimide resins.

25. An antenna for a transponder according to claim 19, wherein the amount of said synthetic resin in the composite material is 3 to 50 weight%.

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cnt. 26. An antenna for a transponder according to claim 19, wherein said flake comprises a cobalt base amorphous alloy, said synthetic resin is an epoxy resin, and the amount of said synthetic resin in the composite material is 10 to 40 weight%.

27. An antenna for a transponder according to claim 19, wherein said magnetic core has a thickness of 0.3 to 2 mm, and a width and length of 100 mm or less, respectively.

28. An antenna for a transponder according to claim 19, wherein said magnetic core has a thickness of 0.3 to 1 mm, a width of 10 to 25 mm and a length of 60 to 80 mm.

Sub 6(A) 29. An antenna for a transponder according to claim 19, wherein the diameter of the coil conductor is 100 to 200 μm .

30. An antenna for a transponder according to claim 19, wherein said coil is wound on the magnetic core perpendicular to the longer side of the magnetic core.

Sub 6(B) 31. An antenna for a transponder according to claim 19, wherein said antenna for a transponder is suitable to carry as an ID card, a commuter pass or a coupon ticket which operates at a frequency over 100 kHz.

32. A transponder comprising two plate antennas set forth in claim 19, and an air-core antenna composed of spirally wound conductor.

33. A transponder according to claim 32, wherein the axes of said two or three antennas are perpendicular to each other.

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34. A transponder according to claim 32, wherein said two plate antennas are provided in the plate transponder so that the axes of said two antennas or coils are perpendicular to each other, and said air-core antenna composed of the spirally wound conductor is provided in the plate transponder so that the axis thereof is perpendicular to the transponder plate.

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35. A transponder according to claim 32, wherein said antenna for a transponder is suitable to carry as an ID card, a commuter pass or a coupon ticket which operates at a frequency over 100 kHz.

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